



ANIMAL KINGDOM

Levels of Organisation

Cellular: Sponges.
Tissue level: Coelenterates, Ctenophores.
Organ level: Platyhelminthes.
Organ system- Annelida, Arthropoda and higher animals.

Symmetry

Asymmetric- Sponges.
Radially symmetry: Coelenterates, Adult Echinoderms, Ctenophores.
Bilateral symmetry: Annelida to Chordate, larvae of Echinoderm.

Germ layer

Diploblastic: Sponge, Coelenterates, Ctenophores.
Triploblastic: Platyhelminthes and higher animals.

Digestive system

Incomplete- Platyhelminthes, Coelenterates.
Complete- Aschelminthes to Chordates.

Coelom

Acoelomate- Sponges, Coelenterate, Platyhelminthes.
Pseudocoelomate- Aschelminthes.
Coelomate- Annelids and higher animals.

Circulatory system

Open: blood vessels absent.
Closed: blood vessels present.

Notochord

It is mesodermally derived rod like structure formed on dorsal side during embryonic stage.
Chordates: animals with notochord in any stage of life.
Eg- Fish, Amphibia, Reptile, Bird, Mammal.
Non-chordates: Porifera to Hemichordata.

Segmentation

Body is externally & internally divided into segments with serial repetition of at least some organs. Show Metameric segmentation.
Eg- Earthworm (Annelida).
Segmentation also seen in Arthropodes & Chordates.

BASIS OF CLASSIFICATION

CLASSIFICATION OF ANIMALS

PHYLUM PORIFERA

- **Habitat**- They are generally marine; some fresh water.
- **Canal system**- water enter through ostia into central cavity (spongocoel) & goes out through osculum.
- Helpful in food gathering, respiratory exchange & waste removal.
- **Choanocytes/collar cells (flagellated)**- lines spongocoel.
- **Digestion**- intracellular.
- **Skeleton**- spicules & spongin fibres.
- **Reproduction**- hermaphrodite (bisexual); asexually by fragmentation.
- **Fertilisation**- internal with indirect development (larval stage is found with morphologically dissimilar larvae).
- **Eg**- *Sycon* (scypha), *Spongilla* (fresh water sponge), *Euspongia* (bath sponge).

PHYLUM COELENTRATA (CNIDARIA)

- **Habitat**- Aquatic; mostly marine; sessile or free swimming.
- **Cnidoblasts/Cnidocytes**- Contain stinging capsules/nematocysts & present on tentacles & used for anchorage, defense, prey capturing.
- **Body cavity**- have central gastrovascular cavity with single opening (hypostome)
- **Digestion**- both extra & intracellular.
- **Skeleton**- Corals have calcium carbonate skeleton.
- **Basic body forms**- Polyp (sessile & cylindrical form of *Hydra*, *Adamsia*) & medusa (umbrella-shaped & free swimming like *Aurelia*/ Jellyfish).
- **Eg**- *Hydra*, *Aurelia* (Jelly fish), *Obelia* (Sea fur), *Physalia* (Portuguese man of war), *Adamsia* (sea anemone), *Pennatula* (sea pen), *Gorgonia* (sea fan), *Meandrina* (brain coral) **Alternation of generation** (metagenesis), Shown by *Obelia*.

PHYLUM CTENOPHORA

- Also called sea walnuts/comb jellies
- **Habitat**- exclusively marine
 - Special organ- 8 external rows of ciliated comb plates help in locomotion.
 - **Digestion**- both extra & intra-cellular
 - **Special property**- bioluminescence (emits light).
 - **Reproduction**- only sexual (hermaphrodite).
 - **Fertilisation**- external with indirect development.
 - **Eg**- *Pleurobrachia* & *Ctenoplana*.



PHYLUM PLATYHELMINTHES FLAT WORMS

- **Body shape**-dorsoventrally flattened.
 - **Habitat**-mostly endoparasites (in animals.)
 - **Special structure**-hooks & suckers are found for clinging & absorption. Some absorb nutrients directly from surface of host.
 - **Excretory cells**-flame cells help in osmoregulation.
 - **Reproduction**- hermaphrodites.
 - **Fertilisation**-internal with indirect development (many larval stages).
- Planaria possess high regeneration capacity.
- **Eg**-*Taenia* (tape worm), *Fasciola* (liver fluke), *Planaria*.

PHYLUM ASCHELMINTHES ROUND WORMS

- **Body shape**- circular cross section.
- **Habitat**- free-living, aquatic, terrestrial, parasite on plant & animal.
- **Digestive system**-complete with well developed muscular pharynx.
- **Excretion**-Rennet cells(H-shaped tube) removes waste through excretory pore.
- **Reproduction**-unisexual/ dioecious.
- **Dimorphism**- male smaller than female.
- **Fertilisation**-internal with direct or indirect development.
- **Eg**- *Ascaris* (round worm), *Wucheria* (filarial worm).

PHYLUM ANNELIDA

- **Body shape**-marked out into metameres/ segments (latin-*annulus* or little ring).
- **Habitat**- aquatic, terrestrial, free-living, rarely parasite
- **Locomotory organs**-body wall has longitudinal & circular muscles. Aquatic annelids like *Neries* possess lateral appendages, Parapodia for swimming.
- **Circulatory system**-closed.
- **Excretory system**-nephridia help in osmoregulation.
- **Nervous system**-paired ganglia connected by lateral nerves to a double ventral nerve cord.
- **Reproduction**- some unisexual (*Neries*), some bisexual (Earthworm, Leech).
- **Eg**- *Nereis*, *Pheretima* (Earthworm), *Hirudinaria* (blood sucking leech).

PHYLUM ARTHROPODA

- Largest phylum (includes insects).
- **Segmentation**-present.
- **Skeleton**-exoskeleton is of Chitin.
- **Body division**-head, thorax, abdomen.
- **Locomotion**-by jointed appendages.
- **Respiration**-by gills, book gills, book lungs, tracheal system.
- **Circulatory system**-open.
- **Sensory organs**-antennae, compound & simple eye, statocysts/balance organs are found.
- **Excretion**-through malpighian tubules.
- **Reproduction**-dioecious Fertilisation-usually internal (oviparous) with direct or indirect development.
- **Eg**- Economically useful-*Apis* (honeybee), *Bombyx* (silkworm), *Laccifer* (lac insect)
- **Vectors**- Anopheles, Culex, Aedes (Mosquitoes)
- **Gregarious pest**-Locusta (locust).
- **Living fossil**-*Limulus* (king crab).

PHYLUM MOLLUSCA 2ND LARGEST PHYLUM

- **Habitat**-terrestrial or aquatic (marine/ freshwater).
- **Body division**-covered by calcareous shell & is unsegmented with a distinct head, muscular foot, visceral hump.
- **Special structure**-soft & spongy layer of skin forms a mantle over the viscera hump.
- **Respiration & excretion**-space between hump & mantle (mantle cavity) have feather like gills which perform respiration & excretion.
- **Sense organ**-anterior head has sensory tentacles.
- **Feeding organ**-mouth have file like rasping organ called radula.
- **Reproduction**-usually dioecious & oviparous with indirect development.
- **Eg**-*pila* (apple snail), *pinctada* (pearl oyster) *Sepia* (cuttle fish), *Loligo* (squid), *Octopus* (devil fish), *Aplysia* (sea hare), *Dentalium* (tusk shell), *Chaetoplura* (chiton).

PHYLUM ECHINODERMATA SPINY BODIED

- **Habitat**-all marine.
 - **Endoskeleton**-Calcareous ossicles.
- Show retrogressive metamorphism (larvae is bilateral symmetrical but adult is radial).
- **Digestive system**-complete with mouth on ventral/ lower & anus on dorsal/ upper side.
 - **Water vascular system**-help in locomotion, capture & transport of food, respiration.
 - **Excretory system**-absent Reproduction-dioecious.
 - **Fertilisation**-usually external with indirect development (free swimming larvae).
 - **Eg**- *Asterias* (starfish), *Echinus* (sea urchin), *Antedon* (sea lily), *Cucumaria* (sea cucumber) & *Ophiura* (brittle star).



PHYLUM HEMICHORDATA

- Earlier was considered as a sub- phylum under Chordata but now placed separately under non-chordata.
- **Habitat**-worm like marine organisms
- **Body shape & division**-body is cylindrical & contains anterior proboscis, a collar & a long trunk. Proboscis gland is present.
- **Circulatory system**-open Respiration-by gills
- **Excretory organ**-proboscis gland
- **Reproduction**-dioecious animals
- **Fertilisation**-external with indirect development
- **Eg**-*Balanoglossus* & *Saccoglossus*

PHYLUM CHORDATA

Characteristic features:- notochord, dorsal hollow nerve chord, paired pharyngeal gill slits,post anal tail,closed circulatory system

It is divided into 3 sub-phyla

1. Urochordata/tunicata,
2. Cephalochordata
3. Vertebrata

CHORDATA

Urochordata

Exclusively marine, notochord present only in larval tail.
Eg- Ascidia, Salpa, Doliolum.

Cephalochordata

Notochord extends from head to tail & is persistent throughout their life.
Eg- Branchiostoma (*Amphioxus* or Lancelet)

VERTEBRATA

Class Cyclostomata

- Ectoparasites on fishes,6-15 pair of gill slits, cranium & vertebral column are cartilaginous (sucking circular mouth), they migrate to fresh water for spawning
- **Eg- Petromyzon(Lamprey), Myxine (Hagfish)**

Class Chondrichthyes (Cartilaginous Fish)

- Cartilaginous endoskeleton, ventral mouth (notochord persistent throughout life), gill slits are separate without operculum, placoid scales are present(modification of teeth), lack air bladder,poikilothermous (cold blooded),male bear claspers, internal fertilisation, viviparous.
- **Eg- Electric Organ Present(Torpedo), Poison Sting-trygon(Sting Ray),Scoliodon (Dog fish),Pristis(Saw fish), Carcharodon (Great White Shark)**

Class Osteichthyes (Bony Fish)

- Mouth is terminal,4 pair of gill covered by operculum,cycloid/ ctenoid scales are present,air bladder is present which regulates buoyancy,development is indirect.
- **Eg- Exocoetus (Flying fish), Hippocampus (Sea Horse), Fresh Water- Labeo(Rohu), Catla(Katla), Clarias(Magur) Aquarium-betta(Fighting fish), Pterophyllum(Angel fish)**

TETRAPODE

Class Amphibia

Cold blooded,body divided into head & trunk,have eyelids, have tympanum which represents ear,have common chamber cloaca for alimentary canal, urinary & reproductive tracts which open outside,3- chambered heart.

Eg- Bufo(Toad), Rana(Frog),Hyla(Tree Frog), Salamandra (Salmander),Ichthyophis (Limbless Amphibia)

Class Aves

feathers are found, forelimbs modified into wings,oil glands are present at the base of the tail, hindlimbs have scales, endoskeleton is bony (ossified) & long bones are hollow with air cavities (pneumatic), crop & gizzard are found, warm blooded organisms (homiothermous).

Eg- Corvus(Crow).Columba (Pigeon), Psittacula (Parrot), Struthio(Ostrich), Pavo(Peacock),Aptenodytes(Penguin), Neophron(Vulture)

Class Reptilia

Cold blooded,skin is cornified & epidermal scaled or scutes are found,tympanum represents ear, 3-chamber heart except crocodile, snakes & lizard shed their scales as skin cast, fertilisation is internal(direct development)

Eg- Chelone (Turtle), Testude(Tortoise), Chamelion(Tree Lizard), Calotes (Garden Lizard),Crocodilus(Crocodile), Allig Ator(Alligator),Hemidactylus (Wall Lizard), Poisoning Snakes- Naja(Cobra), Bangarus (Crait), Vipera(Viper)

Class Mammalia

Found in various habitat,mammary glands are found, skin possess hair,external ear in form of pinnae,different types of teeth are found, warm blooded.

Eg- Oviparous-> Ornithorhynchus (Platypus), Viviparous-> Macropus (Kangaroo), Pteropus(Flying Fox),Camelus(Camel), Macaca(Monkey),Rattus (Rat), Canis (Dog), Felis(Cat), Elephas (Elephant), Eqqus(Horse), Delphinus(Common Dolphin), Balaenoptera(Blue Whale), Tiger, Lion, Pterous(Bat)